Remarks

Entry of this Amendment, reconsideration of the application and allowance of all claims are respectfully requested. Claims 1-20 & 26-28 remain pending.

By this paper, independent claims 1, 8 & 20 are amended to separate the preamble from the body of the claim to address the claims objection noted in the outstanding Office Action. Further, dependent claims 21-25 are canceled herein without prejudice. The subject matter of these claims is believed well-covered by the remaining pending claims. Based on these amendments, withdrawal of the claim objections, 35 U.S.C. §101 rejection and 35 U.S.C. §112 rejection is respectfully requested.

Further, new claims 26-28 are provided herein. These claims correspond to claims already issued in a related foreign application, and are well-supported by the specification as filed. No new matter is added to the application by any amendment presented.

In the Office Action, claims 1-8 & 20-23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Schuyler (U.S. Patent No. 5,832,526; hereinafter Schuyler), further in view of Klausmeier et al. (U.S. Patent No. 6,487,202; hereinafter Klausmeier) and Ofek et al. (U.S. Patent No. 5,751,993; hereinafter Ofek); and claims 9-11 & 25 were rejected under 35 U.S.C. §103(a) as being unpatentable over Schuyler, Klausmeier, and Ofek, and further in view of Steiner et al. (U.S. Patent No. 6,023,710; hereinafter Steiner), while claims 12-19 & 24 were rejected under 35 U.S.C. §103(a) as being unpatentable over Schuyler, Klausmeier, Ofek, Steiner and further in view of Kuo et al. (U.S. Patent No. 6,003,134; hereinafter Kuo). Each of these rejections is respectfully, but most strenuously, traversed and reconsideration thereof is requested.

Applicants request reconsideration and withdrawal of the obviousness rejection to all claims on the following grounds: (1) the Office Action has misinterpreted the teachings of Klausmeier, thus voiding the basis for the rejection of the independent claims; (2) the combination of documents fails to disclose Applicants' claimed invention; (3) the basis for the combination of documents set forth in the Office Action is deficient; (4) the documents themselves lack any teaching, suggestion or incentive for their further modification as necessary to achieve Applicants' recited invention; and (5) the combination, to the extent characterized in

the Office Action, is a hindsight reconstruction of the claimed invention using Applicants' own disclosed subject matter.

In one aspect, Applicants' invention is directed to a computer-implemented technique for securely managing an arbitrary number of data files in non-volatile storage in order to restore data should abortion of a write operation occur (e.g., see claims 1, 8 & 20). The data is stored in a record oriented data structure with each of the records containing, in addition to the data content itself, a first reference indicating the current data-containing record of a previous file, and a second reference indicating the current data-containing record of a subsequent file. The write operation is a two-stage operation, and includes an update stage and an atomic write stage. During the update stage, multiple update operations are performed for a plurality of records employing the second references of at least some records of the plurality of records. After completion of the multiple update operations, the updates to the plurality of records are accepted in the atomic write stage. The atomic write stage employs the first references of the at least some records of the plurality of records. Thus, in Applicants' recited invention, a doubly-linked list is employed wherein the second references of the records link forward and facilitate the updates to the plurality of records, and the first references of the records link backwards and facilitate the acceptance of the plurality of updates in a single atomic write stage, wherein each update is sequentially backwards accepted.

Advantageously, Applicants' record-oriented data structure with the doubly-linked list ensures that at all times during the write operation all the data files affected by the write operation contain either all the records stored prior to the write operation or all the data as modified subsequent to the write operation. In Applicants' approach, synchronicity of updates across records is guaranteed and a single atomic write stage is employed to finalize multiple updates to the plurality of records. Applicants' doubly-linked list structure provides a mechanism which allows data to be maintained as existing prior to an update operation until the single atomic write operation has been performed. This ensures the ability to recover from an interruption during the write operation.

In contrast, Schuyler discloses a method and apparatus for using slack area of file storage structures for file reconstruction. The file-reconstruction data includes a unique end-of-file tag code positioned within a vital core section of limited length. The vital core section is located

close to or against the end of the slack area. Less-essential file-reconstruction data is grown frontwards from the vital core section to the beginning of the slack area as room permits. During file recovery, the random access storage device is scanned for storage sub-areas containing the predefined, unique end-of-file tag code appropriately positioned within the vital core portion at the end of the sub-area. Each storage sub-area having such a properly-positioned end-of-file tag code is designated as a possible end-of-file sub-area. A file recovery program uses this and other available information to reconstruct the directory structure to whatever extent is made possible. (See Abstract of Schuyler.)

Although Schuyler describes various file recovery techniques, a careful reading of Schuyler fails to uncover any teaching or suggestion of a write operation approach such as recited by Applicants in the independent claims presented herein. Specifically, there is no teaching or suggestion in Schuyler of a record-oriented data structure within each of the records which contains, in addition to the data contents, a first reference indicating the current data-containing record of a previous file, and a second reference indicating the current data-containing record of a subsequent file. Applicants' recited record-oriented data structure is essentially a doubly-linked list, including both a backward reference to the current data-containing record of a previous file, and a forward reference to the current data-containing record of a subsequent file.

There is simply no backward linking in the data structure described by Schuyler. Further, Applicants respectfully submit that a careful reading of Schuyler fails to uncover any express reference to even forward linking as recited by Applicants. In Applicants' recited invention, the record-oriented data structure includes a second reference which indicates the current data-containing record of a subsequent file.

Still further, Schuyler does not teach or suggest provision of a write operation as recited by Applicants in the independent claims. In Applicants' write operation, a first update stage is employed, followed by a second atomic write stage. In the update stage, multiple write operations are performed for a plurality of records employing the second references of at least some records of the plurality of records. After completion of the multiple update operations, Applicants' write operation accepts the updates to the plurality of records in one atomic write stage. The atomic write stage employs the first references of the at least some records of the plurality of records. Thus, in accordance with Applicants' write operation, there is a forward

linked updating of the records, and a backward linked acceptance of the updates to the records. No similar functionality is believed taught or suggested by Schuyler or the other art of record.

The Office Action recognizes certain of the above-noted deficiencies of Schuyler when applied against Applicants' independent claims. Specifically, at page 5, lines 5-11, the Office Action recognizes that Schuyler does not disclose records containing a second reference indicating the current data-containing record of a subsequent file, wherein the write operation comprises an update stage and an atomic write stage, the update stage comprising multiple update operations performed for a plurality of records employing the second references of at least some records of the plurality of records, and wherein the updates to the plurality of records are accepted by one atomic write stage after completion of the multiple update operations. Klausmeier and Ofek are cited as allegedly disclosing these aspects of Applicants' claimed process. This conclusion is respectfully traversed. The conclusion is believed based, in part, on a mischaracterization of Klausmeier's teachings at column 9, lines 17-41 (cited in the Office Action).

Klausmeier discloses a method of executing a sequence of multiple dependent operations, each operation including a memory read and a memory write involving overlapping memory accesses of the operations by grouping together memory reads and memory writes of multiple operations and preserving a desired sequence of the operations using a circuit external to a memory through which the memory accesses are performed. The operations may be updates to one or more linked lists. In one embodiment, the step of overlapping memory accesses may be performed by grouping together memory accesses according to ATM cell arrivals or departures. In this embodiment, the operations are associated with ATM cell arrivals or departures and may be GETs or PUTs, each GET and PUT operation may be characterized by a number of atomic memory operations to update one or more link lists. To perform the operations, a circuit is provided having an address processor, a data processor coupled to the address processor and to the external memory, and a prefetch buffer coupled to the external memory, the address processor and the data processor. The address processor generates memory addresses for the operations according to the steps of overlapping memory accesses. The atomic memory operations are grouped so that all of the memory read operations associated with the dependent operations are performed before all of the memory write operations associated with the dependent operations are performed. (See Abstract of Klausmeier.)

Klausmeier depicts in Fig. 6 a queue controller, which is described, in part, at column 8, line 12 – column 10, line 3, with column 9, line 17-29 & lines 27-41 being specifically cited in the Office Action. A careful reading of this Klausmeier material fails to uncover any relevancy to Applicants' claimed process.

Specifically, column 9, lines 17-29 of Klausmeir state:

> In order for head array 704, tail array 706 and queue array 708 to reflect the current state of cell memory 622, Queue Controller 600 should be informed every time a cell is stored in cell memory 622 (cell arrival event) and every time a cell is to be transmitted from cell memory 622 (cell departure event). In addition, the above-discussed arrays must be updated for each cell move event (a cell move occurs when a cell is moved from a VC queue to a QBin queue – in fact, the cell is not physically moved with cell memory 622, however, various linked list pointers for each queue involved in the move event must be updated). Such updating requires a number of atomic operations for each cell event.

Applicants respectfully submit that there is no teaching or suggestion in the above-noted lines of Klausmeier for a record-oriented data structure such as recited by Applicants in the independent claims. In Applicants' invention, each of the records contains, in addition to data contents, a first reference indicating the current data-containing record of a previous file, and a second reference indicating the current data-containing record of a subsequent file. This information is then employed in a write operation that includes two stages, an update stage and an atomic write stage. During the update stage, multiple update operations are performed for a plurality of records employing the second references of at least some records of the plurality of records. These updates to the plurality of records are then accepted in one atomic write stage after completion of the multiple update operations. No similar processing functionality is taught or suggested by Klausmeier. The Office Action provides no discussion as to how the above-noted teaching of Klausmeier can be extrapolated and made relevant to Applicants' claimed process.

The Office Action also alleges that Klausmeier teaches Applicants' recited write operation comprising two stages, with updates accepted in a single atomic write stage. This assertion is believed clearly contrary to the teachings of Klausmeier, i.e., to any extent Klausmeier is relevant to Applicants' claimed process. For example, Klausmeier teaches at column 9, lines 28-30, that "such updating requires a number of atomic memory operations for

each cell event." Thus, not only is the underlying disclosure not relevant to Applicants' claimed process, but this extrapolated teaching of Klausmeier is believed contrary to the express description provided therein.

The Office Action further recognizes that Schuyler does not teach that each record contains a first reference indicating the current data-containing record of a previous file, with the one atomic stage employing the first reference of the at least some records of the plurality of records. For this aspect of Applicants' invention, Ofek is cited. Specifically, Ofek notes at column 2, lines 9-19, the existence of a queue implemented as a doubly-linked list which is employed by a cache manager to remove or replace the "least-recently-used" data element in the cache memory. This is clearly a different process than that recited by Applicants. In Applicants' invention, the doubly-linked lists comprising the first references and second references of each record are employed in a write operation that includes two stages. An update stage and a single atomic write stage. The update stage employs the second references of the at least some records of the plurality of records, while the single atomic write stage employs the first references of the at least some records of the plurality of records. No similar processing is taught or suggested by Schuyler, Klausmeier and/or Ofek, singularly or in combination. There is simply no suggestion in these three documents of a process such as recited by Applicants in the independent claims. Thus, in addition to the Office Action misinterpreting the teachings of Klausmeier, Applicants respectfully submit that the documents combined fail to disclose Applicants' claimed process.

Further, Applicants respectfully traverse the combinability of Klausmeier and Ofek with Schuyler as alleged in the Office Action. For example, with respect to Klausmeier, the Office Action provides no rationale for combining Klausmeier with Schuyler, except to indicate that the rationale is suggested by Klausmeier at column 9, lines 17-29, in one instance, and at column 9, lines 27-41, in the other instance. These citations are believed deficient as a basis for alleging the combination of the two documents. Further, as noted by Applicants above, the cited lines are believed mischaracterized in the Office Action, and to any extent applicable, actually teach away from Applicants' claimed process. A careful reading of the cited lines fails to uncover any suggestion that would lead one skilled in the art to extrapolate a teaching such as noted in the Office Action and apply that teaching to Schuyler. Further, the Office Action provides no explanation as to why the cited lines of Klausmeier suggest the combination. Absent such an explanation, Applicants respectfully submit that the Office Action is deficient and requests

reconsideration and withdrawal of the obviousness rejection to the independent claims presented based thereon.

Further, the combination of Ofek with Klausmeier and Schuyler is also believed deficient for the above-noted reasons. The Office Action fails to provide any explanation as to why one of ordinary skill in the art would have combined Ofek with Schuyler and Klausmeier. The only motivation indicated by the Examiner is a citation to column 2, lines 9-19 of Ofek, which describe a cache manager and a queue, with the queue being implemented as a doubly-linked list. However, Applicants are not claiming simply a doubly-linked list, but rather, claim a specific write operation process which includes two stages, an update stage and an atomic write stage, with one of the references being employed in the update stage, and the other of the references being employed in the atomic write stage. No similar process functionality is believed taught or suggested by Ofek at column 2, lines 9-19, notwithstanding the teaching of a queue comprising a doubly-linked list. The Office Action provides no explanation as to how one of ordinary skill in the art would go about combining the teachings of Ofek, and Klausmeier into Schuyler to arrive at Applicants' claimed process. Absent this showing, it is respectfully submitted that a *prima facie* case of obviousness is not stated in the Office Action against the independent claims presented.

For at least this additional reason, Applicants respectfully request reconsideration and withdrawal of the obviousness rejection to all claims presented.

Still further, Applicants respectfully submit that upon a review of Schuyler, Klausmeier and Ofek, there is no suggestion, or incentive for combining and further modifying the processing thereof as would be necessary to achieve Applicants' invention. To the extent addressed in the Office Action, the characterizations and teachings of, particularly, Klausmeier and Ofek, set forth no technical basis outside that contained in Applicants' own specification for the extrapolated teachings cited therein and the combinability thereof with Schuyler to arrive at Applicants' claimed invention. In this aspect, Applicants respectfully submit that the characterizations of the teachings of Klausmeier and Ofek merely assert language of Applicants' claimed invention in hindsight. Thus, the rejection violates the well-known principle that Applicants' own disclosure cannot be used as a reference against them.

The consistent criterion for the determination of obviousness is whether the art would have suggested to one of ordinary skill in the art that the claimed invention should be carried out and would have a reasonable likelihood of success, viewed in light of the prior art. The suggestion and the expectation of success must be found in the prior art, not in the Applicants' disclosure. In re Dow Chemical Company, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1998) (multiple citations omitted). The alleged combination at issue is in part characterized in the language of Applicants' own disclosure, rather than an identified basis in the prior art for achieving the modifications necessary to arrive at Applicants' claimed invention, in violation of this well-known principle. This is yet another, independent reason why the current invention is not obvious over the applied patents.
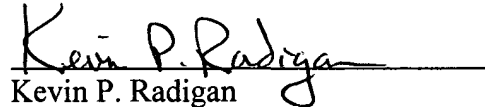
In summary, Applicants traverse the rejection of the independent claims based on the mischaracterization of the Klausmeier patent; the combination of documents fail to disclose Applicants' claimed invention; the basis for the combination of documents set forth in the Office Action are deficient; the documents themselves lack any teaching, suggestion or incentive for their further modification as necessary to achieve Applicants' recited invention; and the combination, to the extent characterized in the Office Action, is a hindsight reconstruction of the claimed invention using Applicants' own disclosed subject matter.

For the above reasons, Applicants respectfully submit that the independent claims patentably distinguish over the teachings of Schuyler, Klausmeier and Ofek. Thus, reconsideration and withdrawal of the obviousness rejection based thereon is respectfully requested.

The dependent claims are believed allowable for the same reasons as the independent claims, as well as for their own additional features. In this regard, Applicants note that Steiner and Kuo are each cited in the Office Action in connection with various dependent claims at issue. Neither of these patents is believed to recite the particular record-oriented data structure of Applicants' independent claims, nor the process for performing a write operation employing such a data structure. These patents do not address any of the above-noted deficiencies of Schuyler, Kausmeier and Ofek when applied against the independent claims.

All claims are believed to be in condition for allowance, and such action is respectfully requested. Should the Examiner continue to entertain reservations concerning the allowability of any claims pending, Applicants request the opportunity to conference with the Examiner.

Respectfully submitted,

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